EL 465779864

PTO/SB/29 (10-00)
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CONTINUED PROSECUTION APPLICATION (CPA) REQUEST TRANSMITTAL

Submit an original, and a duplicate for fee processing.

(Only for Continuation or Divisional applications under 37 CFR 1.53(d))

CHECK BOX, if applicable:
[X] DUPLICATE

Address to:

Assistant Commissioner for Patents
Box CPA
Washington, DC 20231

Attorney Docket No. of Prior Application	MI22-1196
First Named Inventor	Vishnu K. Agarwal
Examiner Name	J. Fenty
Group Art Unit	2815
Express Mail Label No.	EL 465779864 US

This is a request for a ☐ continuation or ☐ divisional application under 37 CFR 1.53(d), (continued prosecution application (CPA)) of prior application number 09 / 388,063 filed on August 30, 1999, entitled See 1 in Addendum

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NOTES

FILING QUALIFICATIONS: *The prior application identified above must be a nonprovisional application that is either: (1) complete as defined by 37 CFR 1.51(b), or (2) the national stage of an international application in compliance with 35 U.S.C. 371. Effective May 29, 2000, a CPA may only be filed in a utility or a plant application if the prior nonprovisional application was filed before May 29, 2000. A CPA may be filed in a design application regardless of the filing date of the prior application. See "Request for Continued Examination Practice changes to and Provisional Application Practice,"* Final Rule, *65 Fed. Reg. 50092 (Aug. 16, 2000); Interim Rule, 65 Fed. Reg.14865 (Mar. 20, 2000), 1233 Off. Gaz. Pat. Office (Apr. 11, 2000).*

C-I-P NOT PERMITTED: *A continuation-in-part application cannot be filed as a CPA under 37 CFR 1.53(d), but must be filed under 37 CFR 1.53(b).*

EXPRESS ABANDONMENT OF PRIOR APPLICATION: *The filing of this CPA is a request to expressly abandon the prior application as of the filing date of the request for a CPA. 37 CFR 1.53(b) must be used to file a continuation, divisional, or continuation-in-part of an application that is not to be abandoned.*

ACCESS TO PRIOR APPLICATION: *The filing of this CPA will be construed to include a waiver of confidentiality by the applicant under 35 U.S.C. 122 to the extent that any member of the public who is entitled under the provisions of 37 CFR 1.14 to access to, copies of, or information concerning, the prior application may be given similar access to, copies of, or similar information concerning, the other application or applications in the file jacket.*

35 U.S.C. 120 STATEMENT: *In a CPA, no reference to the prior application is needed in the first sentence of the specification and none should be submitted. If a sentence referencing the prior application is submitted, it will not be entered. A request for a CPA is the specific reference required by 35 U.S.C. 120 and to every application assigned the application number identified in such request. 37 CFR 1.78(a).*

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

1. ☐ Enter the unentered amendment previously filed on _____ under 37 CFR 1.116 in the prior nonprovisional application.
2. [X] A preliminary amendment is enclosed.
3. This application is filed by fewer than all the inventors named in the prior application, 37 CFR 1.53(d)(4).
   a. ☐ ***DELETE*** the following inventor(s) named in the prior nonprovisional application:
   b. ☐ The inventor(s) to be deleted are set forth on a separate sheet attached hereto.
4. ☐ A new power of attorney or authorization of agent (PTO/SB/81) is enclosed.
5. Information Disclosure Statement (IDS) is enclosed:
   a. ☐ PTO-1449
   b. ☐ Copies of IDS Citations

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CLAIMS	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
	TOTAL CLAIMS (37 CFR 1.16(c) or (j))	28 -20* =	8	x $ 18.00 =	$ 144.00
	INDEPENDENT CLAIMS (37 CFR 1.16(b) or (i))	5 -3** =	2	x $ 80.00 =	160.00
	MULTIPLE DEPENDENT CLAIMS (if applicable) (37 CFR 1.16(d))			+ $ =	
				BASIC FEE (37 CFR 1.16)	710.00
				Total of above Calculations =	1,014.00
	Reduction by 50% for filing by small entity (Note 37 CFR 1.27).				
	* Reissue claims in excess of 20 and over original patent. ** Reissue independent claims over original patent.			TOTAL =	1,014.00

6. ☐ Small entity status: Applicant claims small entity status. See 37 CFR 1.27.
7. The Commissioner is hereby authorized to credit overpayments or charge the following fees to Deposit Account No. 23 - 0925 :
   a. [X] Fees required under 37 CFR 1.16.
   b. [X] Fees required under 37 CFR 1.17.
   c. ☐ Fees required under 37 CFR 1.18.
8. [X] A check in the amount of $1,114.00 is enclosed.
9. ☐ Payment by credit card. Form PTO-2038 is attached.
10. ☐ Applicant requests suspension of action under 37 CFR 1.103(b) for a period of _____ months (not to exceed 3 months) and the fee under 37 CFR 1.17(i) is enclosed.
11. ☐ New Attorney Docket Number, if desired _____
    [Prior application Attorney Docket Number will carryover to this CPA unless a new Attorney Docket Number has been provided herein.]
12. a. ☐ Receipt For Facsimile Transmitted CPA (PTO/SB/29A)
    b. [X] Return Receipt Postcard (Should be specifically itemized, See MPEP 503)
13. ☐ Other: . . . . . .

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NOTE: ***The prior application's correspondence address will carry over to this CPA UNLESS a new correspondence address is provided below.***

14. NEW CORRESPONDENCE ADDRESS

[X] Customer Number or Bar Code Label 021567 (Insert Customer No. or Attach bar code label here) or ☐ New correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone		Fax	

15. SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Name (Print /Type)	Bernard Berman
Signature	
Registration No. (Attorney/Agent)	37,279
Date	Sept 5, 2001

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Addendum

1. Capacitors Having A Capacitor Dielectric Layer Comprising A Metal Oxide Having Multiple Different Metals Bonded With Oxygen

EL 465779864

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Priority Application Serial No. 09/388,063
Priority Filing Date ..... August 30, 1999
Inventor ..... Vishnu K. Agarwal
Assignee ..... Micron Technology, Inc.
Priority Group Art Unit 2815
Priority Examiner ..... J. Fenty
Attorney's Docket No. MI22-1196
Title: Capacitors Having a Capacitor Dielectric Layer Comprising a Metal Oxide Having Multiple Different Metals Bonded With Oxygen

Preliminary Amendment Accompanying a CPA Filed in Response to the June 20, 2001 Final Office Action

To: Box CPA
Assistant Commissioner for Patents
Washington, D.C. 20231

From: Bernard Berman (Tel. 509-624-4276; Fax 509-838-3424)
Wells, St. John, Roberts, Gregory & Matkin P.S.
601 W. First Avenue, Suite 1300
Spokane, WA 99201-3828

Sir:

Responsive to the Final Office Action dated June 20, 2001, Applicant respectfully requests reconsideration of the above-referenced application in view of the remarks that follow.

AMENDMENTS

In the Specification

None

In the Claims

Cancel Claims 1-4.

5. A capacitor comprising first and second conductive electrodes having a high k capacitor dielectric region positioned therebetween, the high k capacitor dielectric region comprising a layer of metal oxide having multiple different metals bonded with oxygen, one of the metals when bonded with oxygen having a first current leakage potential, another of the metals when bonded with oxygen having a second current leakage potential which is greater than the first current leakage potential, the layer comprising at least one portion having a greater concentration of the one metal bonded with oxygen which is more proximate at least one of the first and second electrodes than another portion more proximate a center of the layer.

6. The capacitor of claim 5 wherein the another portion has a greater concentration of the another of the metals bonded with oxygen than the one portion.

7. The capacitor of claim 5 wherein the layer comprises portions having a greater concentration of the one metal bonded with oxygen more proximate both the first and second electrodes than the another portion more proximate the center of the layer.

8. The capacitor of claim 5 wherein the at least one portion contacts the one electrode.

9. The capacitor of claim 5 wherein the layer comprises portions having a greater concentration of the one metal bonded with oxygen more proximate both the first and second electrodes than the another portion more proximate the center of the layer, said greater concentration portions respectively contacting the first and second electrodes.

10. The capacitor of claim 5 wherein the metal oxide with multiple different metals bonded with oxygen comprises a titanate, and the one metal comprises titanium.

11. The capacitor of claim 5 the capacitor dielectric region consists essentially of the layer.

12. A capacitor comprising first and second conductive electrodes having a high k capacitor dielectric region positioned therebetween, the high k capacitor dielectric region comprising a layer of metal oxide having multiple different metals bonded with oxygen, one of the metals when bonded with oxygen producing a first material having a first current leakage potential, absence of the one metal in the oxide creating a vacancy and a second material having a second current leakage potential which is greater than the first current leakage potential, the layer comprising at least one portion having a greater concentration of the first material which is more proximate at least one of the first and second electrodes than another portion more proximate a center of the layer.

13. The capacitor of claim 12 wherein the layer comprises portions having a greater concentration of the first material more proximate both the first and second electrodes than the another portion more proximate a center of the layer.

14. The capacitor of claim 12 wherein the at least one portion contacts the one electrode.

15. The capacitor of claim 12 wherein the layer comprises portions having a greater concentration of the first material more proximate both the first and second electrodes than the another portion more proximate a center of the layer, said greater concentration portions respectively contacting the first and second electrodes.

16. The capacitor of claim 12 wherein the metal oxide with multiple different metals bonded with oxygen comprises a titanate, and the one metal comprises titanium.

17. The capacitor of claim 12 the capacitor dielectric region consists essentially of the layer.

18. A capacitor comprising first and second conductive electrodes having a high k capacitor dielectric region positioned therebetween, the high k capacitor dielectric region comprising a layer of metal oxide having multiple different metals bonded with oxygen, one of the metals when bonded with oxygen having a first dielectric constant, another of the metals when bonded with oxygen having a second dielectric constant which is less than the first dielectric constant, the layer comprising at least one portion having a greater concentration of the one metal bonded with oxygen more proximate a center of the layer than another portion more proximate either of the first and second electrodes.

19. The capacitor of claim 18 wherein the another portion contacts one of the first and second electrodes.

20. The capacitor of claim 18 wherein the another portion has a greater concentration of the another of the metals bonded with oxygen than the one portion.

21. The capacitor of claim 18 wherein the layer comprises portions having a greater concentration of the another metal bonded with oxygen more proximate both the first and second electrodes than the one portion more proximate the center of the layer, said greater concentration portions respectively contacting the first and second electrodes.

22. The capacitor of claim 18 the capacitor dielectric region consists essentially of the layer.

23. The capacitor of claim 18 wherein the metal oxide with multiple different metals bonded with oxygen comprises a titanate, and the another metal comprises titanium.

24. The capacitor of claim 18 wherein the metal oxide with multiple different metals bonded with oxygen comprises barium strontium titanate, and the one metal comprises at least one of barium and strontium.

28. The capacitor of claim 25 wherein the layer comprises portions having a greater concentration of the another material more proximate both the first and second electrodes than the one portion more proximate a center of the layer, said greater concentration portions respectively contacting the first and second electrodes.

29. The capacitor of claim 25 the capacitor dielectric region consists essentially of the layer.

30. The capacitor of claim 25 wherein the metal oxide with multiple different metals bonded with oxygen comprises a titanate.

31. The capacitor of claim 25 wherein the metal oxide with multiple different metals bonded with oxygen comprises barium strontium titanate, and the one metal comprises at least one of barium and strontium.

32. (New) A capacitor comprising first and second conductive electrodes having a high k charge storage dielectric region positioned therebetween, the high k charge storage dielectric region comprising a layer of metal oxide having multiple different metals bonded with oxygen, the layer having varying stoichiometry across its thickness, the layer comprising an inner region, a middle region, and an outer region, the middle region having a different stoichiometry than both the inner and outer regions.

REMARKS

Claims 1-31 were pending in the above-referenced application, all stood rejected under §103(a). Applicant cancels Claims 1-4 with out prejudice and traverses such rejection with respect to Claims 4-31. In addition, new Claim 32 is added. Examination of the instant application in view of the amendments and remarks herein is respectfully requested.

In addition, Applicant submits herewith a Supplemental Information Disclosure Statement with PTO Form-1449 and copies of cited art for the Examiner's review and acceptance. The Examiner has not indicated whether or not the drawings submitted August 30, 1999, have been approved. Applicant requests acknowledgement of this approval in the Examiner's next action.

Rejections under 35 U.S.C. §103(a):

Watanabe et al.

Claims 1-31 stand rejected under 35 U.S.C.§103(a) as being unpatentable over Watanabe et al. (U.S. Patent No. 6,153,898, hereinafter "Watanabe"). Claims 1-4 are canceled making the rejection of such claims moot. The remarks below are thus directed to the traversal of the rejection of Claims 5-31.

Claim 5 recites, in pertinent part:

> A capacitor ... having a high k capacitor dielectric region ... comprising a layer of metal oxide having multiple different metals bonded with oxygen, one of the metals when bonded with oxygen having a first current leakage potential, another of the metals when bonded with oxygen having a second current

leakage potential which is greater than the first current leakage potential

The Background section of the instant application describes that while some metal oxides have high dielectric constants (high K) such materials also have high leakage currents, thus making their use in structures such as capacitors problematic since their high leakage currents allows any charge stored in the dielectric layer to dissipate. Applicant's invention, for example the embodiment recited in Claim 5, is directed to providing a high K dielectric region with a leakage current sufficiently low to prevent the rapid dissipation of the stored charge. These characteristics, dielectric constant and leakage current, are important for capacitors that are used in some integrated circuit devices, for example DRAM devices as they are factors in determining both the amount of charge such a capacitor can store and the time that such charge can held by the capacitor before it dissipates.

In the Final Office Action (Paper No. 12), the Examiner reiterated the original rejection of Claims 1-31 from Paper No. 7. This rejection is based upon U.S. Patent No. 6,153,898 to Watanabe, which is directed to a Ferroelectric Capacitor. Ferroelectric capacitors, and the manner in which such capacitors can be used in memory devices, have been know for some time. To establish this general level of knowledge, Applicant provides herewith, the article *The Physics of Ferroelectric Memories*, Physics Today p. 22-27, July, 1998. Referring to the section entitled "How NVFRAMs work" beginning on page 22 of the above-referenced article, it is seen that ferroelectric capacitors, such as taught by

Watanabe, store a Boolean algebraic "1" and "0" as **a polarization state of the ferroelectric layer**. Further reading of this section describes that the polarization state is determined by measuring the voltage passed through the ferroelectric layer when a positive switching voltage is applied. Thus where the polarization of the layer is positive, the measures voltage will be higher than if the polarization of the layer is negative. This functioning of a ferroelectric capacitor in a memory cell is also described in Watanabe at column 6, lines 10-27.

Thus it can be seen that Watanabe's ferroelectric capacitor operates in a completely different manner than the capacitors recited in the claims of the instant application, in that they do not store charge. The dielectric constant and current leakage potential of Watanabe's layers are NOT factors of concern to a skilled artisan forming a capacitor in accordance with Watanabe's teachings. Therefore it is not surprising that Watanabe never mentions either characteristic in the cited patent. Rather, Watanabe discussed polarizability and crystal size in the context varying composition of the layers since such characteristics are important to the artisan being instructed in the forming of a ferroelectric capacitor. As a result, Applicant respectfully asserts that Watanabe DOES NOT teach or even suggest, "one of the metals when bonded with oxygen having a first current leakage potential, another of the metals when bonded with oxygen having a second current leakage potential which is greater than the first current leakage potential" as recited in Claim 5.

The Examiner is also reminded that when applying 35 U.S.C. §103, the claimed invention must be considered as a whole, and any applied reference must likewise be considered as a whole. MPEP §2141. Further, in determining the differences between the prior art and the claims, the question under 35 U.S.C. §103 is not whether differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. MPEP §2141.02. In addition, a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. MPEP §2141.02. Also, there must be some suggestion or motivation to modify a reference to arrive at the Applicant's claim, and as Watanabe is directed to ferroelectric capacitors that are read by sensing a polarity, none is seen in Watanabe. MPEP §2143.01.

where the structure cited above is the value of the dielectric constant and leakage current are the important criteria in selecting a material for an electrical capacitor, polarizability and crystal size are the important criteria for a material used in a ferroelectric capacitor as such capacitors DO NOT STORE CHARGE.

To this effect, Watanabe discusses the how the polarizability of the materials employed for layers 15a, 15b and 15c varies with changing composition. Watanabe teaches, at col. 4, lines 22-24, that "[t]here is a relationship between the formula and the residual polarization value of the oxide" (where the formula refers composition of the material is question). Watanabe further states that this variation (in polarizability)

results in the layers (15a, 15b and 15c) having a different proportion of the first material (in at least one layer) which consequently varies in one direction through the depth of the layers and provides for both maintaining excellent ferroelectricity and the reduction of crystal grain size (see, col. 4, lines 28-39). Watanabe DOES NOT teach or even suggest that any variation in the potential of the layers results from this changing composition, as alleged by the Examiner.

In summary, Applicant having responded to each of the rejections and objections, respectfully asserts that Claims 5-32 are in condition for allowance. Action to that effect is earnestly sought. If, however the Examiner's next action is anything other than a Notice of Allowance, the Examiner is requested to call the undersigned to schedule a telephonic interview. The undersigned is available during normal business hours, Pacific Coast Time.

Respectfully submitted,

Dated: Sept 5, 2001

By: Bernard Berman
Bernard Berman
Reg. No. 37,279

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Priority Application Serial No. 09/388,063
Priority Filing Date ..... August 30, 1999
Inventor ..... Vishnu K. Agarwal
Assignee ..... Micron Technology, Inc.
Priority Group Art Unit 2815
Priority Examiner ..... J. Fenty
Attorney's Docket No. MI22-1196
Title: Capacitors Having a Capacitor Dielectric Layer Comprising a Metal Oxide Having Multiple Different Metals Bonded With Oxygen

VERSION WITH MARKINGS TO SHOW CHANGES MADE ACCOMPANYING PRELIMINARY AMENDMENT

The claims have been amended as follows. Underlines indicate insertions and ~~strikeouts~~ indicate deletions.

Cancel Claims 1-4.

Add Claim 32.

US 093880630OP1

Creation date: 04-02-2004
Indexing Officer: SBARNES1 - SYBIL BARNES
Team: OIPEBackFileIndexing
Dossier: 09388063

Legal Date: 02-27-2002

No.	Doccode	Number of pages
1	A...	2
2	CLM	7
3	REM	16

Total number of pages: 25

Remarks:

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